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(54) INTERIOR MATERIAL OF AUTOMOBILE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an interior material of an automobile which can reduce the noise in the automobile so as to improve comfortableness of a driver and a passenger, while maintaining the characteristics as the interior material of the automobile, such as lightweight properties, heat insulating properties, moldability and heat resistance.

SOLUTION: In respect to a non-air-permeable closed-cell foamed laminated sheet regarded heretofore as difficult to be given a sound-absorbing performance, the degree of freedom of the vibration of a non-foamed layer laminated on a foamed layer is enhanced by making the foamed layer highly foamable and the sound-absorbing performance is given by utilizing the effect of interference of the sound generated by the vibration of the non-foamed layer. Thus, both of the non-air-permeability and the sound-absorbing performance are given compatibly to the material.

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CLAIMS

[Claim(s)]

[Claim 1] Automobile interior material which it has the structure which carried out the laminating of the non-foaming layer (4 5) which becomes both sides of a foaming layer (3) to which a foaming layered product (2) uses denaturation polyphenylene ether system resin as base material resin from thermoplastics in the automobile interior material which consists of epidermis material (1) and a foaming layered product (2), and the expansion ratio of a foaming layer (3) exceeds 20 times, and is characterized by being 100 or less times.

[Claim 2] Automobile interior material according to claim 1 characterized by being 25 to 70 times the expansion ratio of a foaming layer (3) of this.

[Claim 3] Automobile interior material according to claim 1 or 2 characterized by the thermoplastics which is base material resin of a non-foaming layer (4) being denaturation polyphenylene ether system resin.

[Claim 4] Automobile interior material according to claim 1, 2, or 3 characterized by for the content of the phenylene ether component in the denaturation polyphenylene ether system resin which is base material resin of a foaming layer (3) being 35 % of the weight - 75 % of the weight, and the content of a styrene system component being 65 % of the weight - 25 % of the weight.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to automobile interior material. in more detail, in order to raise crew's amenity, the noise in the car can be reduced -- automobile interior material Seki is carried out.

[0002]

[Description of the Prior Art] Conventionally, what carried out the laminating of the urethane foam to the base material which makes thermoplastics foam a subject as automobile interior material, and the thing which fabricated the laminating sheet which carried out the laminating of the non-foaming layer of a styrene maleic anhydride copolymer in the vertical side of the foaming layer of a styrene maleic anhydride copolymer in the desired configuration are used widely. Those automobile interior material has the description that it is lightweight, adiathermic is high and fabrication nature is excellent.

[0003] However, when the long duration pan of the above conventional automobile interior material was carried out to the elevated temperature, since thermal resistance was inadequate, the front section might hang down by the self-weight, and problems, such as producing a (heat sag) and deformation, might be generated.

[0004] Then, in order to solve these problems, the automobile interior material which used an inorganic glass fiber and composite material of plastics as the base has come to be used. However, in this composite material, although the quality of thermal resistance is maintainable, since lightweight-ization was not able to be attained upwards and the glass fiber was used, there was a problem that recycle nature was bad and became cost quantity.

[0005] In order to solve such a problem, the foaming laminating sheet for automobile interior material using the foaming laminating sheet which carried out the laminating of the denaturation PPE system resin non-foaming layer to both sides of the denaturation polyphenylene ether system resin (it is described as "denaturation PPE system resin" below.) foaming layer which is lightweight and has thermal resistance is proposed (JP,4-11162,U). Moreover, the foaming laminating sheet for automobile interior material which carried out the laminating of the denaturation PPE system resin non-foaming layer to both sides of the denaturation PPE system resin foaming layer which specified many physical properties, such as expansion ratio of 5-20 times, thickness of 2-6mm, and 5 - 25% of rates of an open cell etc., is proposed by JP,6-344483,A. The foaming laminating sheet for automobile interior material using these denaturation PPE system resin is excellent in thermal resistance, and since it is lightweight, it supposes that hanging down by the deformation and the self-weight under an elevated temperature etc. will be improvable.

[0006] Furthermore, although the automobile is high-performance[upgrading and]-ized and calm nature in the car is called for in recent years In order not to give the absorption-of-sound engine performance which is deeply related to calm nature in the car in the automobile interior material using the above-mentioned denaturation PPE system resin foaming laminating sheet but to make the absorption-of-sound engine performance give To stick acoustic material, such as use of the expensive epidermis material to which the absorption-of-sound engine performance was given, and an urethane foaming layer, etc. was needed, and the rise of ingredient cost or a manufacturing cost was caused.

[0007] On the other hand, what used urethane foam (JP,63-199182,A), urethane foam, fiber (JP,2-63703,A), and a staple fiber (JP,2-95838,A) from the former as automobile interior material equipped with the absorption-of-sound engine performance is known. In the automobile interior material equipped with these absorption-of-sound engine performance, if a sound hits a base material, the viscous friction of air arises [that aerial vibration] in propagation and this hole part to the air of the hole part inside a base material, a part of energy of a sound will be transformed into heat energy, and the absorption-of-sound engine performance will arise. That is, by resistance to a motion of air, the vibration declines and the effectiveness that a sound becomes small is used. In addition, in order to make this effectiveness discover, a base material needs to have permeability. However, when the base material which has permeability was used and the flow of air arose from the interior-of-a-room side of a car to an outdoor side, since an epidermis layer played a role of a filter and the epidermis layer upper part became dirty in the shape of a hole, it had become a problem.

[0008]

[Means for Solving the Problem] It was making a foaming layer form into high foaming in the closed cell system foaming laminating sheet of the non-permeability considered that grant of the former absorption-of-sound engine performance is difficult, and the degree of freedom of vibration of a non-foaming layer by which the laminating was carried out to the foaming layer raises, and it came to complete [that the absorption-of-sound engine performance can give by using the cross protection of the sound by vibration of a non-foaming layer, and] header this invention wholeheartedly as a result of research that this invention persons should solve the above-mentioned problem.

[0009] That is, this invention is automobile interior material which it has the structure which carried out the laminating of the non-foaming layer (4 5) which becomes both sides of a foaming layer (3) to which a foaming layered product (2) uses denaturation polyphenylene ether system resin as base material resin from thermoplastics in the automobile interior material which consists of [1] epidermis material (1) and a foaming layered product (2), and the expansion ratio of a foaming layer (3) exceeds 20 times, and is characterized by to be 100 or less times.

[2] Automobile interior material given in [1] characterized by being 25 to 70 times the expansion ratio of a foaming layer (3) of this.

[3] [1] characterized by the thermoplastics which is base material resin of a non-foaming layer (4) being denaturation polyphenylene ether system resin, or automobile interior material given in [2].

[4] Automobile interior material of any 1 publication of [1] - [3] characterized by for the content of the phenylene ether component in the denaturation polyphenylene ether system resin which is base material resin of a foaming layer (3) being 35 % of the weight - 75 % of the weight, and the content of a styrene system component being 65 % of the weight - 25 % of the weight.

[0010]

[Embodiment of the Invention] Next, the example of the automobile interior material concerning this invention and the foaming laminating sheet for automobile interior material is explained in detail based on a drawing.

[0011] Drawing 1 shows the configuration of the automobile interior material concerning 1 operation gestalt of this invention, it comes to form the non-foaming layer (an in-the-car side non-foaming layer (4) and vehicle outside non-foaming layer (5)) which uses thermoplastics as base material resin in both sides of the foaming layer (3) which uses heat resistant resin as base material resin, and the laminating of the epidermis material (1) is carried out to the top face of an in-the-car side non-foaming layer (4) through the hot-melt-adhesive layer (6).

[0012] The automobile interior material which the foaming layer (3) which uses heat resistant resin as base material resin is a layer used as the base of automobile interior material, and is a secondary foaming laminate-molding object since this layer (3) consists of resin with good thermal resistance and moldability can fabricate easily. Moreover, since this layer (3) is a foaming layer, it is lightweight and excels in adiathermic, and since the consistency is low, the amount of use resin is little, and it ends, and has cost competitiveness.

[0013] Any resin known by this contractor can be used for it under the condition that the heat resistant resin used as base material resin of the foaming layer (3) of this invention has thermal resistance. if it illustrates, it will be polyester resin illustrated with denaturation polyphenylene ether system resin (denaturation PPE system resin); polycarbonate resin; and polybutylene terephthalates,

and polyethylene terephthalate, such as a blend object of heat-resistant polystyrene system resin; polystyrene or heat-resistant polystyrene, such as a styrene-acrylic-acid copolymer, a styrene maleic anhydride copolymer, and a styrene-itaconic-acid copolymer, and polyphenylene ether (PPE), and a styrene graft polymerization object to PPE. [, such as a styrene phenylene ether copolymer,] Two or more sorts can also be used for these resin. When denaturation PPE system resin is used as base material resin of a foaming sheet also in this, it excels in quality, such as thermal resistance and rigidity, and also is desirable at workability and the point that manufacture is easy.

[0014] As PPE system resin used for conversion PPE system resin For example, Pori (2, 6-dimethyl phenylene -1, 4-ether), Pori (2-methyl-6-ethyl phenylene-4-ether), Pori (2, 6-diethyl phenylene 1, 4-ether), Pori (2, 6-diethyl phenylene -1, 4-ether), Pori (the 2-methyl-6-n-propyl phenylene -1, 4-ether), Pori (the 2-methyl-6-n-butyl phenylene -1, 4-ether), Pori (the 2-methyl-6-KURORU phenylene -1, 4-ether), Pori (the 2-methyl-6-bromine phenylene -1, 4-ether), Pori (the 2-ethyl-6-KURORU phenylene -1, 4-ether), etc. are mentioned, and these are independent -- or two or more sorts are combined and it is used.

[0015] PS system resin which forms PPE system resin and mixed resin is resin which uses styrene or its derivative, for example, alpha methyl styrene, 2, 4-dimethyl styrene, mono-KURORU styrene, dichloro styrene, p-methyl styrene, ethyl styrene, etc. as a principal component among denaturation PPE system resin. Therefore, PS system resin may be the copolymer made by copolymerizing not only with the homopolymer which consists only of styrene or a styrene derivative but with other monomers.

[0016] Moreover, as an example of a polymerization and the styrene monomer which carries out graft polymerization preferably, styrene, alpha methyl styrene, 2, 4-dimethyl styrene, mono-KURORU styrene, dichloro styrene, p-methyl styrene, ethyl styrene, etc. are raised to said PPE system resin, for example. These may be used independently and may be combined two or more sorts. Among these, styrene is desirable from versatility and the point of cost.

[0017] As base material resin used for the foaming layer of this invention, when using conversion PPE system resin As a phenylene ether component, 65 - 25 weight section desirable still more preferably as 35 - 75 weight section and a styrene component as a phenylene ether component -- as 35 - 60 weight section and a styrene component -- 65 - 40 weight section -- 62 - 42 weight section is good as 38 - 58 weight section and a styrene component as a phenylene ether component especially preferably. It is in the inclination for thermal resistance to be inferior when there are few mixed rates of PPE system resin, and when there are many mixed rates of PPE system resin, there is an inclination for the viscosity at the time of a heating flow to rise, and for foaming to become difficult.

[0018] As for a denaturation PPE system resin foaming layer, it is desirable that thickness is 3-20mm and further 4-10mm. The thickness of a foaming layer may be inferior to reinforcement and adiathermic in it being less than 3mm, and it may not be suitable as automobile interior material. On the other hand, when exceeding 20mm, it may be unsuitable practically from the reasons of reservation of the tooth space of the automobile interior of a room, the limit on interior design, etc.

[0019] Expansion ratio exceeds 20 times and, as for a denaturation PPE system resin foaming layer, it is desirable that they are 100 or less times and further 25 to 70 times. They are 30 to 60 times most preferably. When automobile interior material [in / in this / this invention] gathers the scale factor of a foaming layer, a spring multiplier is reduced, the cross protection of the sound by vibration of the non-foaming layer by which the laminating was carried out to the foaming layer is used, and when expansion ratio is 20 or less times, the effectiveness of spring constant reduction does not tend not to improve rather than is enough. [absorption-of-sound engine performance's] Moreover, when expansion ratio exceeds 100 times, a cel film consistency becomes low too much, and there is an inclination for thermal resistance to get worse.

[0020] 70% or more and 80 more% or more of a denaturation PPE foaming layer has a desirable rate of a closed cell. When the rate of a closed cell is less than 70%, there is an inclination to be inferior to adiathermic and rigidity.

[0021] To the base material resin of the foaming layer (3) used in this invention, a cellular regulator, a shock-proof amelioration agent, lubricant, an antioxidant, an antistatic agent, a pigment, a stabilizer, an odor reduction agent, etc. may be added if needed.

[0022] Next, the non-foaming layer (4 5) of thermoplastics is formed in both sides of a heat-

resistant-resin foaming layer (3) at the automobile interior material concerning this invention. It has the work which controls the heating contraction by an in-the-car side non-foaming layer (4) changing a configuration in the direction in which the work which controls the heating contraction of epidermis material (1) by which a laminating is carried out to the front face of one of these, and the cel which became flat for the foaming layer (3) in the front face of another side to be extended at the time of shaping cancel ellipticity at the time of heating among these non-foaming layers (4 5). Moreover, a vehicle outside non-foaming layer (5) has the work which controls heating contraction of a foaming layer (3).

[0023] It is very difficult to influence heating contraction of a foaming layer (3) greatly here by whenever [change / of a cel configuration and the cel internal pressure by care of health /, rate of closed cell, and stoving temperature] etc., and to control the contraction. However, since deformation of the front section under an elevated temperature is greatly influenced by heating contraction of a foaming layer (3), it becomes important [controlling heating contraction of a foaming layer (3) by the non-foaming layer (4 5) by which the laminating was carried out to both sides of a foaming layer (3)].

[0024] next, as thermoplastics used for a non-foaming layer (4 5) Although heat-resistant PS system resin, denaturation PPE system resin, a polypropylene resin, polyethylene terephthalate (PET) system resin, polyamide (nylon) system resin, etc. are mentioned, and these are independent, or two or more sorts are combined and it is used When using denaturation PPE system resin as a foaming layer (3), denaturation PPE system resin and heat-resistant PS system resin are preferably used from an adhesive viewpoint with this resin layer.

[0025] When using denaturation PPE system resin as a non-foaming layer (4 5) The monomer which makes a subject PPE system resin and a styrene system compound, or its polymer performs denaturation by the polymerization or mixing like the case of an above-mentioned foaming layer (3). For example, mixture with the PPE-styrene copolymer which carried out the polymerization of the styrene monomer to the mixed resin of PPE system resin and PS system resin and PPE system resin, this copolymer and PS system resin, or PPE system resin, the mixture of that copolymer, PPE system resin, and PS system resin, etc. are mentioned. among these -- coming out -- the mixed resin of PPE system resin and PS system resin is easy for manufacture -- etc. -- it is desirable from a point.

[0026] It is the same as that of the case where the example of these PPE(s) system resin, PS system resin, or a styrene monomer, the example of instantiation, PS system resin, a styrene monomer, and the monomer in which a polymerization is possible, the reason for using it, etc. are explained in the foaming layer 3 although it was desirable. However, the styrene-butadiene copolymer represented with HIPS is added as a desirable example of PS system resin from the point that the shock-proof improvement effect of a non-foaming layer (4 5) is large.

[0027] When using conversion PPE system resin, as a phenylene ether component, 75 - 25 weight section is desirable still more desirable as 15 - 75 weight section and a styrene component, and 80 - 40 weight section is good as base material resin used for a non-foaming layer (4 5), as 20 - 60 weight section and a styrene component as a phenylene ether component. If it is in the inclination for thermal resistance to be inferior when the operating rate of PPE system resin is too small and the operating rate of PPE system resin is too large, the viscosity at the time of a heating flow may rise, and shaping may become difficult.

[0028] Heat-resistant PS system resin desirable as base material resin of a non-foaming layer (4 5) is the copolymer (it is described as "St system copolymer" below.) of styrene or its derivative, and other monomers, and nitril compounds, such as unsaturated carboxylic acid, such as a maleic acid, a fumaric acid, an acrylic acid, methacrylic acid, and an itaconic acid, or a derivative of those and its acid anhydride, acrylonitrile, and meta-acrylonitrile, or the derivative of those is mentioned, for example as the styrene which has a heat-resistant improvement effect, or the derivative and the monomer which can be copolymerized. These may be used independently, may be combined two or more kinds and may be used. The styrene which has a heat-resistant improvement effect, or the derivative and the monomer which can be copolymerized is usually preferably used in 30 or less % of the weight of the range 40 or less % of the weight.

[0029] Moreover, in case the polymerization of styrene or the styrene derivative is carried out, you

may be a copolymer with nitril compounds, such as unsaturated carboxylic acid, such as that to which the polymerization of synthetic rubber or the rubber latex was added and carried out, a maleic acid, a fumaric acid, an acrylic acid, methacrylic acid, and an itaconic acid, or a derivative of those and its acid anhydride, acrylonitrile, and meta-acrylonitrile. Among these, a styrene-maleic-anhydride system copolymer, a styrene-acrylic-acid system copolymer, a styrene-methacrylic acid system copolymer, and acrylonitrile-butadiene-styrene copolymer are desirable from the heat-resistant improvement effect, versatility, and the field of cost then.

[0030] Heat-resistant PS system resin may be used independently, or may be combined two or more kinds. Moreover, heat-resistant PS system resin may be blended with other thermoplastics, and may be used, and vinyl chloride system resin, such as polyolefines, such as polystyrene, HIPS, a polycarbonate, polyester, polyethylene, and polypropylene, and a polyvinyl chloride, a polyether ether sulfone, polysulfone, polyamides, those copolymers, etc. are raised as thermoplastics to blend. Among these, the field of that versatility and homogeneity distribution are possible then, that the shock-proof improvement effect of a non-foaming layer is large, and cost etc. to HIPS is desirable. Being able to use a thing well-known as HIPS, the content of a rubber component is usually 1 - 15 % of the weight.

[0031] The thickness of a non-foaming layer (4 5) has 50-300 micrometers desirable further 75-200 micrometers. When the thickness of a non-foaming layer (4 5) is thinner than 50 micrometers, reinforcement, rigidity, thermal resistance, etc. are inferior, and in being thicker than 300 micrometers, it is in the inclination for the moldability of a laminating sheet to be inferior.

[0032] Moreover, this invention is a thing using the cross protection of the sound by vibration of a non-foaming layer (4 5) by which the laminating was carried out to the foaming layer (3) made to high-foam, and it makes it possible to improve the absorption-of-sound engine performance in the frequency domain which tunes up a resonance frequency and is needed as automobile interior material by adjusting the rigidity of a non-foaming layer (4 5), and a superintendent officer. Therefore, the superintendent officer of a non-foaming layer and rigidity are set as arbitration by the frequency domain which wants to improve the absorption-of-sound engine performance.

[0033] Furthermore, the laminating of the shock absorbing material (air cap) of the structure which shut up air between the resin films of foam and non-permeability which become a non-foaming layer (4 5) from polyolefine forms, such as nonwoven fabrics, such as felt, polyurethane foam, and polyethylene, polypropylene, etc. may be carried out to a non-foaming layer (4 5) through an adhesives layer for the purpose of broadcloth-izing a resonance vibration peak. Since-izing of the resonance vibration peak can be carried out [broadcloth] cheaply, especially the thing done to a non-foaming layer (4 5) for the laminating of the shock absorbing material (air cap) is effective.

[0034] independent [in a shock-proof amelioration agent, a bulking agent, lubricant, an antioxidant, an antistatic agent, a pigment, a stabilizer, an odor reduction agent, etc.] if needed, when forming a non-foaming layer (4 5) -- or two or more sorts may be combined and you may add.

[0035] In case a shock-proof amelioration agent conveys punching processing, laminating sheet, and Plastic solid at the time of fabricating the laminating sheet on which carried out the laminating of the non-foaming layer (4 5) to the foaming layer (3), and it was made to foam the 2nd order as automobile interior material, it is effective in preventing the crack of a non-foaming layer (4 5) etc. If the effectiveness is demonstrated by mixing to base material resin as a shock-proof amelioration agent, it can be especially used without limitation. A shock-proof amelioration agent may be the component which can demonstrate the shock-proof amelioration effectiveness introduced into thermoplastics by denaturation by the polymerization, for example, also when mixing what contains a shock-proof amelioration component like HIPS and using it for a non-foaming layer, it can give shock resistance to a non-foaming layer (4 5).

[0036] A hot-melt-adhesive layer (6) is formed in the front face of the in-the-car side non-foaming layer (4) of a foaming laminating sheet. Hot melt adhesive is usually used for pasting up epidermis material (1) on a Plastic solid. As said hot melt adhesive, what uses resin, such as a polyolefine system, a denaturation polyolefine system, a polyurethane system, an ethylene-vinyl acetate copolymerization resin system, a polyamide system, a polyester system, a thermoplastic rubber system, a styrene-butane diene copolymer system, and a styrene-isoprene copolymer system, as a component is mentioned.

[0037] As an example of epidermis material (1), what is used as conventional automobile interior material can be used. For example, although textile fabrics and a nonwoven fabric are arranged, in these, they are polyethylene terephthalate, polypropylene, a polyamide (nylon), a polyacrylonitrile, and modacryl (for example, the thing of natural materials, such as synthetic resin, such as "a money Charon (trademark)" by Kaneka Co., Ltd. etc., and wool, cotton, and the thing which combined them suitably are used.). What carried out the laminating of the foaming layer which changes from polyolefine forms, such as polyurethane foam, and polyethylene, polypropylene, to such epidermis material (1) further if needed in the monolayer or the double layer can be used.

[0038]

[Example] Although this invention is further explained at a detail based on an example below, thereby, this invention does not receive a limit at all. The resin used for the example and the example of a comparison is shown in Table 1. In addition, each sign about the resin shown in Table 1 is as follows.

[0039]

[Table 1]

	商品名	製造会社	PPE成分 (%)	PS成分 (%)	ゴム成分 (%)	その他
変性PPE樹脂(a)	ノリル EFN4230	日本GE プラスチック機	70	30		
PS樹脂(b)	スタイロン GB102	A&M ポリスチレン機		100		
SMAA共重合体 樹脂(c)	スタイロン G9001	A&M ポリスチレン機		92		メタクリル酸 8
HIPS樹脂(d)	スタイロン HB117	A&M ポリスチレン機		87.5	12.5	
耐衝撃性改良剤 (e)	タフブレン 125	A&M ポリスチレン機			100	

[The class of resin]

Denaturation PPE : Denaturation polyphenylene ether PS : Polystyrene SMAA copolymer: Styrene-methacrylic acid copolymer HIPS : The evaluation approach performed in high impact polystyrene, the example, and the example of a comparison is shown below.

[Expansion ratio] After starting a sample from the general section of automobile interior material and separating each configuration layer, the consistency df of a foaming layer is measured according to JIS K 7222, and it is the consistency dp of denaturation PPE system resin. It measured according to JIS K 7112, and asked from the degree type.

Expansion ratio = dp/df [0040] [Mounting heat resistance test] The automobile head-lining section (cut body) was equipped with automobile interior material (width-of-face [of 930mm] x die length of 1424mm) as shown in drawing 2 , and it fixed so that it might become equivalent to a real vehicle through a sun visor, a room mirror, a room lamp, GANISSHU, and a pillar. In addition, for an assist grip attaching hole and 8, as for a sun visor stop mounting hole and 10, a sun visor attaching hole and 9 are [seven in drawing / a room mirror attaching hole and 11] tonneau-light attaching holes.

Moreover, point of measurement was symmetrically stamped on the front part at intervals of 120mm with the center line of six points and a Plastic solid (a-f in drawing 1). The marked line was formed near the point of measurement of the front section, and a vertical distance was measured. Next, after supplying the automobile head-lining section which attached head-lining material in the thermostatic chamber set as 100**1 degree C for 24 hours, the absolute value of the amount of dimensional changes of the perpendicular direction of the point of measurement stamped on the Plastic solid front section was measured, and the maximum of a-f was recorded. in addition, the max entered in Table 3 -- a variation rate -- an amount is the value which measured plus (+) and the perpendicular hanging-down direction for the direction of a perpendicular curvature riser as minus (-).

[0041] As criteria of a judgment, the following criteria were used in consideration of the practicality as automobile interior material.

耐熱変位量 ○・・・±2. 0mm以下
 ×・・・±2. 0mm以上

[Absorption-of-sound nature] The test piece was cut down from the general section of automobile interior material, and measurement of the normal incidence sound absorption coefficient by JIS-A -

1405 estimated. In addition, in order to bring close to the mounting condition to an automobile, 20mm of back air spaces was prepared, and incidence of the sound was carried out from the epidermis material side.

[Permeability] The test piece was cut down from the general section of automobile interior material, and measurement of the quantity of airflow by JIS-L-1004 estimated. As criteria of a judgment, the following criteria were used in consideration of the practicality as automobile interior material.

通気度 ○・・通気度 0.01 cc/cm² sec 以下

×・・通気度 0.01 cc/cm² sec 以上

[0042]

[Effect of the Invention] (Example 1)

Foaming layer :P Thickness of 5.8mm it is thin from 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, Foaming layer interior-of-a-room side [one 32 times the expansion ratio of this] non-foaming layer :P 20 % of the weight of PE system resinous principles, Film outdoor with a thickness of 120 micrometers it is thin from 80 % of the weight (denaturation PPE (resin a) 28.6 section and the PS (resin b) 71.4 section are mixed) of PS system resinous principles side non-foaming layer : The SMAA (copolymer-resin c) 47.5 section and the HIPS (resin d) 47.5 section, Film epidermis material layer with a thickness of 150 micrometers it is thin from the impact-proof amelioration (agent e) 5 section :P ET system nonwoven fabric epidermis material (100 about 1.0mm in thickness [RVC/ by Japan Vilene Co., Ltd. /-])

Adhesives layer: The piece of a general section blank test of the automobile interior material which consists of a hot melt film (the clan by Kurabo Industries [, Ltd.], Ltd. the better X2200) was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 3 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0043] (Example 2)

Foaming layer :P It considered as the foaming layer 34 times the expansion ratio [the thickness of 5.1mm, and] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the piece of a general section blank test of the automobile interior material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 3 R> 3 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0044] (Example 3)

Foaming layer :P It considered as the foaming layer 42 times the expansion ratio [the thickness of 5.0mm, and] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the piece of a general section blank test of the automobile interior material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 3 R> 3 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0045] (Example 4)

Outdoor side non-foaming layer: 20 % of the weight of PPE system resinous principles, 76.2 % of the weight of PS system resinous principles, rubber component It considered as the film with a thickness of 120 micrometers it is thin from 3.8% (the denaturation PPE (resin a) 28.6 section, the PS (resin b) 41.4 section, and the HIPS (resin d) 30 section are mixed), and except it, the piece of a general section blank test of the automobile interior material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A

measurement result is shown in drawing 4 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0046] (Example 5) It is shock absorbing material (except having carried out the laminating of the air-bubbles shock absorbing material made from Sakai Chemical-industry polyethylene "MINAPAKKU", the piece of a general section blank test of the automobile interior material of the same configuration as an example 3 was started, and a normal incidence sound absorption coefficient and permeability were measured.) on an outdoor side skin. A measurement result is shown in drawing 4 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0047] (Example 1 of a comparison)

Foaming layer :P It considered as the foaming layer 19 times the expansion ratio [the thickness of 3.5mm, and] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the piece of a general section blank test of the automobile interior material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 5 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0048] (Example 2 of a comparison)

Foaming layer :P It considered as the foaming layer 12 times the expansion ratio [the thickness of 2.2mm, and] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the piece of a general section blank test of the automobile interior material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 5 R> 5 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0049] (Example 3 of a comparison)

Foaming layer :P It considered as the foaming layer 15 times the expansion ratio [the thickness of 1.8mm, and] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the piece of a general section blank test of the automobile interior material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 3 R> 3 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0050] (Example 4 of a comparison)

Foaming layer :P It considered as the foaming layer 32 times the expansion ratio [the thickness of 5.8mm, and] of this which consists of 20 % of the weight of PE system resinous principles, and 80 % of the weight (the denaturation PPE (resin a) 28.6 section and the PS (resin b) 71.4 section are mixed) of PS system resinous principles, and except it, the cut body was equipped with the automobile interior material of the same configuration as an example 1, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[Table 2]

	100℃実装耐熱試験 最大変位量(mm)	判定	通気度	判定	垂直入射吸音率 1～5kHzの平均値
実施例1	-1.5	○	0.0	○	0.16
実施例2	-1.2	○	0.0	○	0.18
実施例3	-0.9	○	0.0	○	0.21
実施例4	0.2	○	0.0	○	0.24
実施例5	-1.1	○	0.0	○	0.24
比較例1	-1.2	○	0.0	○	0.07
比較例2	-1.5	○	0.0	○	0.09
比較例3	-1.3	○	0.0	○	0.05
比較例4	-4.5	x	0.0	○	—

[0051]

[Effect of the Invention] Thermal resistance is improved and, as for the automobile interior material of this invention, deformation by the use under an elevated temperature and hanging down by self-weight are improved. And the non-permeability made difficult until now and the outstanding coexistence of the absorption-of-sound engine performance are attained.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the important section enlarged-section explanatory view of the automobile interior material concerning this invention.

[Drawing 2] It is the flat-surface explanatory view showing an example of the automobile interior material which performed trimming processing concerning this invention.

[Drawing 3] It is as a result of [of the normal incidence sound absorption coefficient which prepared 20mm of back air spaces of the automobile interior material of the examples 1-3 concerning this invention] measurement.

[Drawing 4] It is as a result of [of the normal incidence sound absorption coefficient which prepared 20mm of back air spaces of the automobile interior material of the examples 4-5 concerning this invention] measurement.

[Drawing 5] It is as a result of [of the normal incidence sound absorption coefficient which prepared 20mm of back air spaces of the automobile interior material of the examples 1-4 of a comparison concerning this invention] measurement.

[Description of Notations]

1: Epidermis material

2: Foaming layered product

3: Foaming layer

4: In-the-car side non-foaming layer

5: Vehicle outside non-foaming layer

6: Hot-melt-adhesive layer

7: Assist grip attaching hole

8: Sun visor attaching hole

9: Sun visor stop attaching hole

10: Room mirror attaching hole

11: Tonneau-light attaching hole

[Translation done.]

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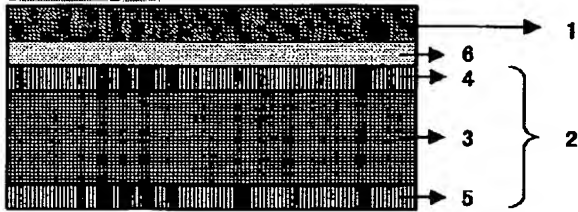
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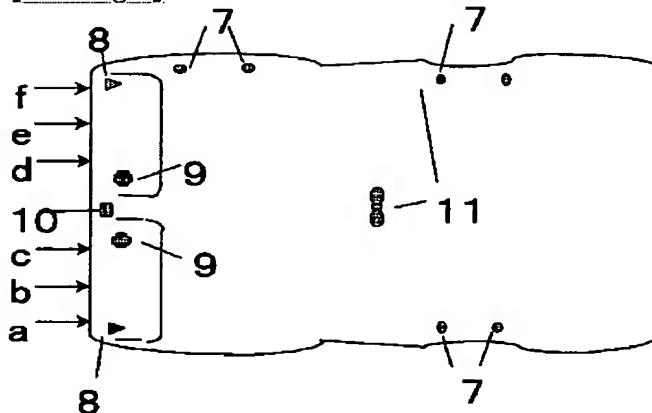
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DRAWINGS

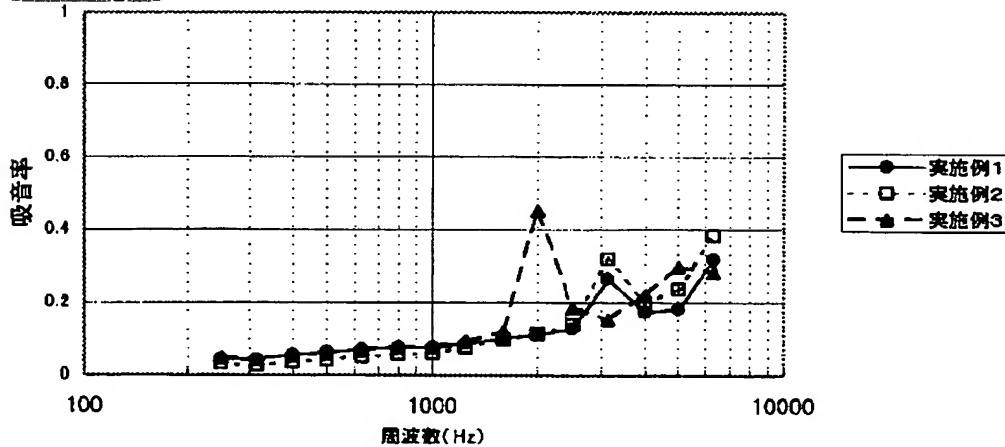
[Drawing 1]



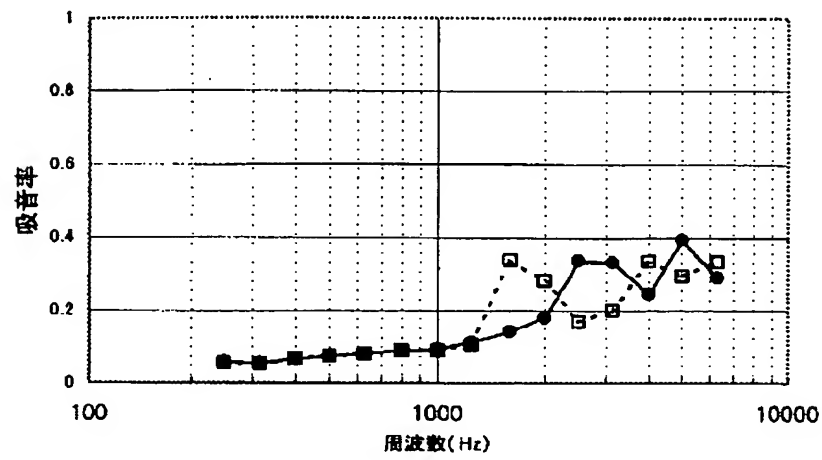
[Drawing 2]



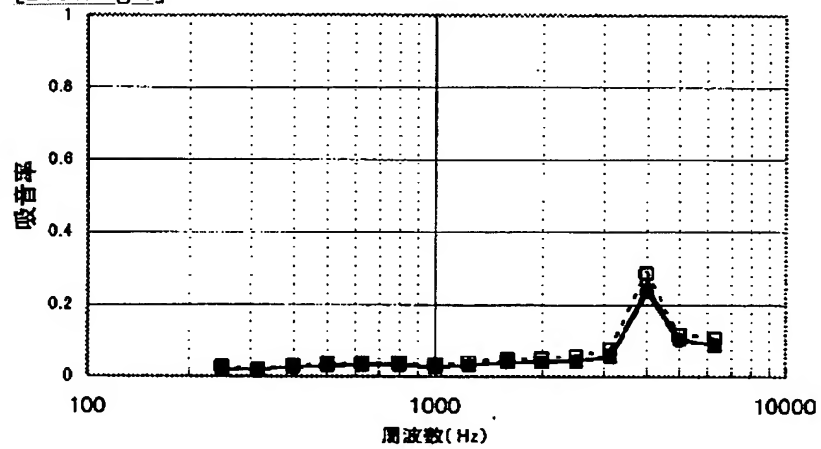
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Translation done.]